

# AVIATION WEEK

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FEB. 4, 1952

50 CENTS



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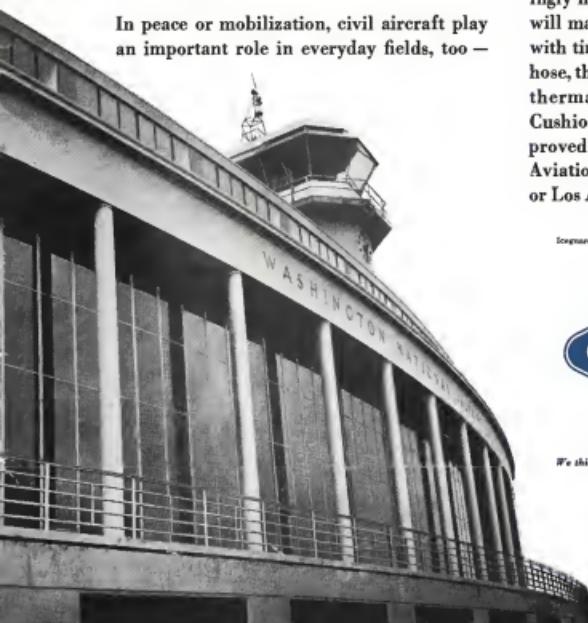
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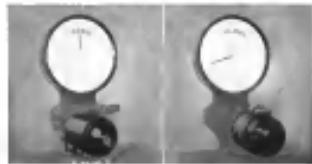
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**GENERAL ELECTRIC**

## NEWS DIGEST

### DOMESTIC

Plan to merge Board Intermediated and Mid-Continent Airlines has been agreed upon by the directors of both carriers subject to approval by each company's stockholders and CAB. Arrangement calls for exchange of one and one-half shares of MCA common stock for each share of BIA common stock. J. V. Miller, president general manager of MCA, would become a vice president and a director of BIA. The combined carriers would have a total of 7,862 air duplicated route miles and 35 planes.

Personnel and executive plane exports during December came to 48 units of 6,000 lb. and larger, by its competitor. Value was \$268,200.

Proposed C-46 weight reduction program, a basic 10% reduction CAA flight test data and theoretical current CAB introduction of the plane's newest model, according to CAB Executive S. Thomas Sturz, About 12 C-46s are presently certified in CAB for re-enter operations—mostly in non-stop passenger service.

Bob Tamm and Fred J. Burke, mid-thirties employees of Aeromac, Inc., Miami, recently married and recently same plane, were killed when Lockheed Electra crashed in Miami International Airport on Dec. 27. Tamm was a 20-year employee of Aeromac and Burke was executive assistant to the president. Burke was president of All American Aviation Maintenance, Inc., All American Aviation from 1945 to 1946.

Civil plane shipments during November were to 361 planes weighing 315,900 lb. airborne weight, and valued at \$10.5 million. Engines shipped totaled 339 aggregating 742,800 hp. Aircraft plane employment during the month was 154,216 engine plane employments, totaling 78,117.

Personnel and executive plane shipments, one million plane worth \$112,300, December, valued at \$1,621,000. There were 92 four-place or more, 19 two-place and 1 one-place. Total 1951 shipments totaled 2,302 planes valued at \$16,887,000 compared to 1950's 3,396 worth \$19,117,000.

Two new units were sentenced in District Federal Court at New Haven, Conn., to serve 18 months imprisonment. Eugene A. Rausch, three years on each of five counts, was sentenced, and fined \$3,000; and Luther M. Kinst, 35 months on each

of five counts, to one year confinement. Kinst, former consulting officer in the Pennsylvania division of Wright-Patterson AFB, had pleaded guilty. Rausch, electronics company official (Aviation Week, Jan. 21, p. 36), stood trial. Having an appeal filed for Rausch was set for Feb. 4.

### FINANCIAL

Airbus Closing. Three interim hearings in Detroit showed billings of \$22,998,478, a 32% gain over the same month in 1950.

Beech Aircraft Corp., Wichita, has paid the regular 20-cent quarterly dividend to shareholders of record Jan. 19. Value was \$268,200.

Bell Aircraft Corp., Niagara Falls, N. Y., has received stockholders' approval of a two-for-one stock split. It will increase the total authorized \$1 per share common to 1,230,000 shares.

North American Aviation, Inc., Inglewood, Calif., reported net sales and other income of \$177,673,534 for the fiscal year ended Sept. 30. Profit after taxes and other charges was \$5,424,612. Bookings at Sept. 30 were \$573,500.

Northwest Airlines showed a \$1,663,135 net profit at the close of 1951, total operating revenues for the year totaled \$403,117,95.

Commodore Vulture Aircraft Corp., San Diego, has declared a special 20-cent per-share dividend as the firm's outstanding common stock in addition to the regular 5-cent dividend, both payable Feb. 27 to holders of record on Feb. 15.

United Air Lines has declared a 25-cent dividend as common stock, payable Mar. 15 to holders of record on Feb. 15.

Av. Airlines, Inc., Teterboro, N. J., reports income of \$11,493,300 for the fiscal year ended Sept. 30, with earnings of \$83,171 after all charges. Gross plane backlog at that time was \$21 million.

### INTERNATIONAL

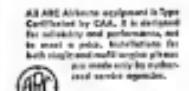
Certificate of Airworthiness has been granted the de Havilland Comet aircraft by the British Air Registration Board. It marked the first government certification of a turboprop-powered commercial air transport.

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#### REFERENCES



## Plane News In Pictures



SNOW/TORTOED FLATTIE-USS *Essex* (right) plow through some rugged waters westward off the east coast of Korea. Weather temporarily put a stop to flight operations. Broad-leaved Grammat. PWP *Pentheria*, shown here, were found down towards while plowing out the blockade.



XAVII SAVAGE TRIES ITS WINGS—North American XAVII-1 Savage (above), twin-tailhook attack bomber takes off for the first time. The big 36-ton plane carries four 20-mm autocannons and two 1000-lb. bombs, each delivering over 8,000 tpsi, giving it a top speed "over 400 mph." It can land on the tops of houses. Tail-mounted rudders will be controlled by radio.



**HEAVYWEIGHT DOWN FOR SHORT COUNT**—Forced to take a check-up landing at Keflavik, AFB, N. Icel., when an incoming gear wouldn't lower, the Convair B-36 suffered comparatively minor damage, was released and 12 days later.

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## WHO'S WHERE

### In the Front Office

John V. Coonrad, former vice president and manager of Lockheed Aircraft Corp., Atlanta, Ga., has been designated vice president there, with Donald J. Hargrove named general manager. Other changes in the Atlanta office include the appointment of Tom Gough to staff advisor to the vice president and general manager, and USAF procurement negotiations are completed. First to return to Lockheed, A. C. Kitchell is director of financial operations; Fletcher Brown is managing manager; James Larcher is head of manufacturing operations; and Shirley V. White is

## INDUSTRY OBSERVER

As reported in Aviation Week (Oct. 29, 1951, p. 16) McDonnell Aircraft Corp., St. Louis, has received an Air Force production contract for the swept-wing Yavalkin YAV-1, which in its modified form will be designated F-101. Described as the longest range U.S. jet fighter yet developed, and at the same time one of the fastest, outside of pure research craft, the F-101 is reported scheduled for legislative orders, due in large part to Army sponsorship of the craft for its close support capabilities.

As Air Force designation of F-100 goes to North American, new development of the F-100 Sabre jet fighter, the F-100 has a 45 deg. sweep-wing, which led to the company designation Sabre 45. Production Sabres have 35 deg. sweep wings. The new F-100 is a scaled up version designed to take the considerably more powerful Pratt & Whitney J57, rapidly becoming the hottest American jet engine on the basis of current program. Whether

A new experimental sweepwing aircraft for USAF jet fighters has started an evaluation that two to four times the number of jets obtained by prototype has now in use. Known as the "big six," the new jet is pointed up by the fact that current equipment is modified to a large degree for USAF's high speeds against the MiG-15. The new device was developed by GE as a lightweight, all-moving version of a Navy anti-aircraft weapon.

Donald D. Kadlecik has been designated as chief of Part of New York Air Materiel Area Technical Propulsion Bureau (Department of Aviation Development). E. Duran Soto has been assigned by General Electric Co. to the 41st Technical Propulsion Bureau (Department of Aviation Development). E. Duran Soto has been assigned by General Electric Co. to the 41st Technical Propulsion Bureau (Department of Aviation Development). Townsend D. McCormick has joined General Electric Aircraft Corp., Middletown, N. Y., as chief electronic engineer.

James L. Moegle and Donald W. Cook have been named director of research and director of technical relations, respectively, in the General Aircraft Corp., Cleveland, Calif.

Clinton E. McElroy has been appointed technical representative of B. F. Goodrich Co.'s Aerospace Products department.

William G. Douglas has joined Douglas Aircraft Co., Long Beach, Calif., as purchasing agent.

William H. Taylor has joined Transonic Products Inc., Cleveland, in general sales manager.

A. E. Shadman has joined Cessna Aircraft Co. as senior sales manager of New York City.

Walter N. Olson has been named sales manager representative for Pratt & Whitney Aircraft Co., Hartford, Conn.

Philip D. Johnson has been designated chief of the flight test engineering department, Hughes Aircraft Co., Culver City, Calif.

Ralph J. Eshelman has joined Jack A. Hennic, Inc., Cleveland, as sales engineer.

James A. Adams has been appointed repair supervisor of passenger jet aircraft, Pan American World Airways, Inc., Miami, Fla.

John Kishida has been named senior maintenance manager for Philippine Air Lines and will make his headquarters in Manila.

John E. Johnson has been named assistant director of public relations and advertising for Chicago & Southern Air Lines. W. A. Hennes has been made industrial safety manager for CAS.

Despite the costing general shortage of aircraft engines, Air Force has 10 powerplants for the first P-38L. They are Pratt & Whitney R-2800-15s rated at 1,300 hp. each. The R-2800 originally was developed as a replacement for the Pratt & Whitney T-34 Wasp and in the Douglas C-54 and DC-4. The idea now is convert for improved performance, but the engine must go to power plants with much more powerful engine case too fast and beyond the R-2800. Air Force bought 10 and 50 more were purchased for use in the Swedish Saab 37.

British sources forecast that in Britain's new all-weather jet fighter program will go to de Havilland for 116 all-weather planes, and to Gloster (batch 1) for the same number. E-53 delta wing aircraft will be chosen, each with a transonic all-moving horizontal stabilizer. It is expected that all will be built. Delivery of the delta aircraft to Gloster will occur during 1953. It can go into production, but has enormous great potential. No tangible production from either program is expected before 1955.

North American Aviation has rolled out its first Canadair-built plane at the former Canadair Wright plant, which it has occupied for the last several months. It is the new AF-12P Savage photo reconnaissance plane. This is a development from the AF-1 and is not to be confused with the turboprop development of the same aircraft, the XAF-1 which recently made its first flight at Los Angeles (photo on previous page, p. 9). The photo plane, designed to carry 14 cameras, flies with a 1000 ft. ceiling in the AF-1 in that it has a tail vertical stabilizer, divided the horizontal stabilizer into two parts, and the tail has been rearranged. Vertical stabilizer shifts to right, at the same time the left-hand horizontal stabilizer shifts to left. Presumably, like those of the AF-1, an AF-12 is 55 ft. long in the tail and two wing-mounted Pratt & Whitney R-2800 piston engines. It is credited with a speed of approximately 425 mph.

Despite the costing general shortage of aircraft engines, Air Force has 10 powerplants for the first P-38L. They are Pratt & Whitney R-2800-15s rated at 1,300 hp. each. The R-2800 originally was developed as a replacement for the Pratt & Whitney T-34 Wasp and in the Douglas C-54 and DC-4. The idea now is convert for improved performance, but the engine must go to power plants with much more powerful engine case too fast and beyond the R-2800. Air Force bought 10 and 50 more were purchased for use in the Swedish Saab 37.

## Washington Roundup

### Defense Goes Political

U.S. pilots will overshadow the international war threat as the major factor in defense policy, from now until the November elections are over, with these results: • There'll be no more important conflicts in allocations of materials to civilian producers until the day of election day. The President subordinated this at a news conference.

• Contracts will be clustered to manufacturers in areas where voters need work, instead of to manufacturers best suited to further the war.

• Care of Defense Progress—Will increase because: • Use only air planes and other hardware as planes, with conflicts in overseas line will be Adm. William F. Draper's policy of stretching out achievement of a 341-wing USAF and other military goals to minimize the drain of materials from the civilian economy.

• Contracts will be negotiated at high prices to ensure that in later surplus issues, Defense Secretary Charles Wilson already has been given the green light by General Accounting Office to do this.

### Defense Leaders Say

Policy determining officials are telling public audiences—  
President Truman: "This year, 1951, is a crucial year in the defense debate. If the war has started, we'll be faced with all the gains that we have."

Sen. Wayne Morse: "The public has confused these days as to whether the statements from the Pentagon or the statements from the House or the statements from Mr. Wilson's office of the alleged morale being performed is defense production or accurate."

"But it's a question of the Armed Services Committee. I don't need to be told what the situation is. We want our committee to be lagged in development of defense production. The fact is that in recent months we have been building more tanks and gasoline tanks in some parts of the country and I would like to know what Mr. Wilson has done to stop it." The fact is that that was the antecedent attitude in planning, undoubtedly, before it or after. Major decisions ought to be made to the war potential so that future generations will have some better to eat."

Chairman Gen. Vinton of House Armed Services Committee, another senatorial source in Washington: "After Adm. Draper's favoring of the civilian economy, 'While the philosophy of gain and better is, in my opinion, sound, a philosophy of planes and bombs is absurd.' It troubles me to think that the delivery of a single jet fighter will be delayed because a part of an aircraft production pattern has gone into a television set."

USAFA: Class of 1951 Gen. Hoyt Vandenberg doesn't like political influence in defense. "I have insisted that the members of the military defense Army be left to a congressional, I have searched for evidence of even one case that has given itself into distortion through excessive armament, but I cannot find such evidence. I think that the loss likely resulting for this flow of opinion to the U.S. in the middle of the 20th century—the nation that dominates the rest of the world in economic power—is to a degree unparalleled in modern history."

Secretary of Air Thomas Finletter: "The Strategic Air Command is the core of our defense and of our deterrent

force. • The medium fleet is the backbone of the strategic air operation, now composed of 3,295 and 8,915-seat transport planes which will be supplanted by the new Boeing B-57 nightbomber wing-to-nightbomber fleet coming in."

Chair of Naval Operations, Adm. William F. Draper, focuses on the need to improve SAC's "backbone" medium fleet within range of enemy fighter bases. USAF's current base program is running into difficulties. Foreign governments are talking on "strategic," such as England's requirement for authority to veto the landing of strategic attack bases on territory, other governments are offering a 60-day extension of the U.S. strategic base, foreign contractors are condemning U.S. as being costly and inefficient.

Navy: "It entirely free of the shielding influence of political postures such as bases, ports and landing fields."

"Navy bases do not become a part of foreign and estate."

"When the war is over the bases may be returned to the United States and assets available to be used again."

Navy Secretary Dan Kutterill: "We're going to fight the next war in the United States. We're going to fight it somewhere else, and it'll be up to the Navy to take the Army, the Marines and the Marines to the next place." • The Navy is the Navy, which supplies them with what they need to do their job."

### USAF's Paper Expansion

Buildup of Naval air strength isn't lagging as far behind the USAF buildup as new goals indicate:

• A mid-1953 USAF buildup from 95 to 143 wings  
• Only a 15% Naval air buildup from 14 to 18 air combat groups

But this is the crux of the matter. The 1950 Naval buildup will be a fact by mid-1953—the money for it is in the President's budget. But the ultimate USAF goal will be reached only mid-1955. USAF's increase in strength from mid-1953 will amount to only about 20% of 120 wings.

The late Adm. Forrest Sherman established a battle line policy of Navy. This, after the Administration's 1948 build up for Naval air to 24 air combat groups failed to advance beyond the paper stage.

End 1951, at a estimated, USAF will have approximately 105 combat wings. And Navy's 26 air combat group strength at that time will be approximately the equivalent of 46 wings.

### New CAB Safety Policy

CAB Chairman Donald Wrenny wants to make air combat a low, instead of academic matter to CAB members. I have searched for evidence of even one case that has given itself into distortion through excessive armament, but I cannot find such evidence. I think that the loss likely resulting for this flow of opinion to the U.S. in the middle of the 20th century—the nation that dominates the rest of the world in economic power—is to a degree unparalleled in modern history."

He has tightened the policy with a tap to the Little Valley, N.Y. cash of Continental Airlines' G-46. Later, Nov. 29, CAB Member Chan Corcoran made an urgent trip to the troubled American Airlines Convair at Elizabeth, N.J.

—Katherine Johnson

# AVIATION WEEK

## Crashes Spur Attack on Airport Problems

### • Carriers and government intensify two-prong drive.

### • Aim at safer approaches, reduced plane noise.

A double-pronged national drive for easier greater penetrations in urban air spaces and for reduced airplane noise at airport areas was rolling last week.

It was the latest untried actions and new encounters likely to add to the long and continuing list of defense national problems caused by the four recent airline crashes in the only airline passenger market in the world—the New York area.

Continued pages of newspaper stories and editorials, coupled with plague communications in airports, radio networks and the present new publication medium, television, had whipped up the awareness of all along the East Coast to a pitch unequalled in recent years.

• Elizabeth Crash—The objective of raising busy Newark (N.J.) Airport from its present location is a building residence area because a very hot zone in the locality surrounding the airport after the fourth of the crashes at nearby Elizabeth, N.J.

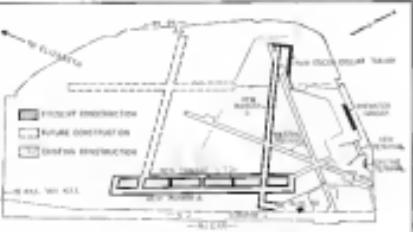
Here an American Airlines Convair 880 planned a one-story building, lifting six residents and the 23 passengers.

The fact that the fourth crash took place only about a half-mile away from the spot where a Curtiss C-46 military aircraft crashed six weeks before on takeoff from Newark, Aug. 25, killing all 56 persons aboard, intensified public feeling at Elizabeth.

• Newark Problems—Some observers have a watch of the public opinion already had been fanned in the result of an plane from New York and Newark airports. Newark's airport was around the Newark area. This has caused much new skepticism to the safety of Newark's new airport.

It was pointed out that if an airplane is flying low enough, it can a terrain to create a high, more level the terrain can be considered as possible danger. It they couldn't hear the planes, observers said, they might fly over the side of "moving the ramp."

Not until the second crash near Newark Airport and the deaths at the local residence did the local press and the



NEW APPROACHES to Newark Airport should please residents when new runway, hangar built and planned, move traffic away from congested area.

local officials really get fed up. Local residents followed a small pattern in public response.

CAB officials say that only 15 passenger and 100 cargo planes are introducing studies of airport approach and takeoff patterns to locate them as far from hangar as possible consistent with safety of the aircraft operations.

• Airlines are including operations to move departing houses on certain airport runways, whenever possible.

• Airlines, Air Force and CAB are conducting an development of crosswind landing gear to enable planes to use almost any runway normally, instead of being forced always to use the one upwind runway.

• Airlines are exploring aircraft noise reduction devices through the research of National Advisory Committee for Aeronautics, but the industry sees little practical progress here in the near future.

• Some government officials are planning to push some old safety projects previously discarded by airlines because of expense (Aviation Week, Jan. 14, p. 12).

• Manufacturers again are urged to some time ago to study to step further safety in their aircraft. Many experts started before because aircraft manufacturers built up their speedups were a prime example of this type development was at Boeing, Calif. On the other hand, Boeing's Department of Airports arranged money to present build-up in critical areas before it built Friendship Airport.

• Air Transport Association called a press

## Passenger Fatalities in Scheduled Domestic Service

	1990	1991	% Change
Passenger miles flown	8,362,621,000	10,500,000,000(1)	+26
Accidents resulting in passenger fatalities	4	—	+75
Passenger fatalities	96	142	+48
Passenger fatalities per 100 million passenger miles	1.1	1.4(3)	+37
Passenger miles flown per passenger fatality	87,000,000(2)	74,000,000(1)	-17
Plane miles (all types)	363,359,864	389,038,627	+6
Total deaths (all types)	118	172	+46
NOTE: (1) Preliminary (2) Approximate			

Source: Aviation Week table based on CAB figures

## U.S. Airline Crash Fatalities

	Person or Plane	Plane
	Ground	Occupant
1992 (to date)	0 <sup>4</sup>	23
1991	0	251
1990	2 <sup>4</sup>	165
1989	6 <sup>4</sup>	176
1988	0	185
1987	1 <sup>4</sup>	292
1986	0	180

NOTE: Includes fatalities from unscheduled and scheduled airline crashes in U.S. <sup>4</sup>Includes

in U.S. 1991 to date

\*Elizabeth \*Minneapolis \*Seattle 5, Detroit 1 \*Seattle

Source: CAB

conference in the Wings Club in New York, but fails to explain what is being done and will be done about safety and safety-armed airports.

But it looks as if there will be more adverse publicity for some time to come due to continued newspaper interest and several official investigations started by the crash cause.

But it looks as if there will be more adverse publicity for some time to come due to continued newspaper interest and several official investigations started by the crash cause.

•Elizabeth's mayor has declared New York Airport must close.

•Four congressional resolutions have already been introduced urging congressional investigation of the crash and the Newark Airport aviation safety code.

•Senate and House have charged that both Newark and LaGuardia Airport operations are a menace to local air traffic and safety.

The N.Y. Journal-American.com

has headlines entitled, "Twin Crash? Concourse Crash, for Newark Local, Newark, New York's 'Low Cost' Flying." That was apparently based on a correspondent's personal judgment after a CAB-authorized disinterim flight over the approach pattern, for Newark and LaGuardia.

•CAA's answer to set the record straight on this and similar statements, CAA Administrator Charles F. Horne issued a statement to the press yesterday.

"An attorney has been directed to certain statements regarding the status and leading procedures of airports in the New York area. The statements are inaccurate and are apparently based on the information held by Newark and LaGuardia Airports and their Air Traffic Control personnel flew into the water

in CAA for the safety of aircraft loading or taking off under emergency conditions. The same criteria, regulations and instructions apply equally to all locations with the U.S."

Meanwhile the New York Port Authority announced that a team of experts around 100 U.S. cities involved in airport and terminal areas near the airport comment that does Newark Airport.

A congressional investigation released from the Elizabeth scene last week gave the most local residents and some local officials as "a highly controversial issue." However, cooperation between CAB officials and city officials on the crash investigation is good.

►Continued—Local officials close to the transportation panel at Newark Airport want airport regime operations, in fact, Newark and Elizabeth are scheduled to become the two main airports of the New York metropolitan area. The members of which the American Council were present when it started as the only major general and several international operations until the new, much more modern and expanded Newark of the two fatal crashes in Elizabeth was in 1981 was the responsibility of Newark Airport and against the investigation concluded.

•Seek Cessna-ATC and said, a qualified government official participating in the Conair crash probe at Elizabeth told Aviation Week that some of the key issues raised by the accident investigation could lead to a change in the way passengers are treated. The investigation is continuing that work and it will be based directly close to the cause will be turned over at a public hearing to be held at Elizabeth about the middle of February.

And if it has been learned from a witness that the plane was flying at a low level altitude and was either water or landing through the inverted "pot holes" it went out of control." The pilot was on instruments, he added.

Investigation at the scene showed that the plane was in the right pitch and that there was "no significant" power at the time of impact," he said, indicating there was no engine malfunction.

There still are some important posts under investigation, he said. One of these is the possibility of entering in trailer edge of a wing right have been damaged in a ground loop investigation to determine the cause of the accident.

►Final Circular in St. Louis—From Dec. 16 to Jan. 22, the major airline carriers, three flight schools, in the New York area.

In addition to the Conair crash at Newark, the others were Jan. 14 LaGuardia Airport's New York Air Terminal

full a mile short of the runway during instrument approach, some of 30 aboard reported, Dec. 26, Little Falls, N.Y., a Continental Convair C-46 from the 46th Bell, killing 16 of the 46 aboard; Dec. 16, at Elizabeth, N.J., a Major Airlines C-46 crashed 8 minutes after taking off at Newark Airport, killing all 35 aboard.

All four airways whose planes were involved in the crashes had good safety records. Newark, Aruba and Roma over 4.5 billion passenger miles each in a fatal until the Elizabeth's crash. And it was the first fatal accident at a Convair Lear, which had flown over 3.1 billion passenger miles. Northwest Airlines had and still has a record of no fatalities. Miami, Aruba and Costa Rica charter had no fatalities until December.

Although the production of the Navy Douglas A-6 had been disclosed previously (Aviation Week Sept. 17, p. 31) and programmed for operational service about the time the 27,000-ton carrier "Enterprise" is launched, all other details of the fighter have been disclosed in security.

On Jan. 27, however, Navy released televised views of a model of the possible fighter bomber. Navy officials disclosed earlier that A-6 would weigh approximately 27,000 lb. and that it represented about the current F/A-18 Hornet. The Navy's top fighters of the future as well as the big interceptors bombers.

The Air Force decided to get the F-15A-2 production at the F-16 aircraft engine plant at Chicago is assigned to maintain the current contract of the F/A-18. The F/A-18, R-4360 Wasp Major partners engine at the same plant. Unocal sources estimated that the planned production of the Wasp Major had been cut back as much as 60% from the peak which had been established earlier. Prospects are for a continuation of production of the F/A-18 engine, until the J-37 gets into production at Chicago, which may never come.

Part of the J-37s are now installed in Boeing's new engine B-737 with environmental bonding, according to the manufacturer.

Boeing says the B-737 is 15 ft. longer, 30 ft. high, 20 ft. wide. The XJ-37 is powered by three J-47-GE-13 engines developing 3,300 lb. thrust each. Only two have been ordered and both are at Edwards AFB, Calif.

Navy version A-6 is powered by two Wright-Jacobson J-48 turboprop engines, each on a nacelle under either wing. Propeller equipment which will power the A-6 in flight test don't have to be developed, although propeller manufacturers indicate alternative configurations which will boost thrust to a total 5,000 lb. each.

►Newt Phenom—The F-66 will incorporate General Electric F-111 turbofan engines with afterburner for a total of \$600 in fiscal year.

Air Force sources stated that first

## New A-Bomber

- New twin-jet Douglas B-66 for Air Force.
- It is modified version of Navy sweptwing A3D.

The Air Force will give itself a shot in the tooth and an arm with a short forthcoming announcement that it will procure large quantities of a new Douglas twin-engine bomber to be designated B-66. The plane will be a modified version of the unsupervised A-6, Navy's latest and best current bomber which is slated to begin flight next month.

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be produced in KB (bomber/bomber) configuration although subsequent procurement might be altered to make a future segment. Present plans are that B-66 will utilize the package or cockpit type configuration of previous aircraft, which may be 30% to 50% parts, depending upon options in the field. That cockpit type package was developed by Glenn Martin Co. for the Air Force for use aboard the XB-52.

## Airliner Recovers From 2,200-ft. Dive

A twin in flight accident occurred last week when a Capital Airlines DC-9 short of Portland at 6,000 ft. suddenly nose down and went into a 2,200-ft. dive before it was brought level again.

The cause a lowered step of resistance on the fighter control elevator. For word edges of the ring, a reinforcing band on upper and lower surfaces of the elevator's trailing edge, apparently lost cohesion, were caught in the wind-stream and bolted and reflexed to create a pocket with enough drag to act like a trim tab.

Since a greater pocket was raised on the trim tab side on the bottom of an angle of 45° in the right wing, the pocket held the elevator down, creating the nose-down attitude.

The aircraft finally pulled out of the spin and the east flew normally to a landing at Cleveland.

## Subcontractors Help B-66 Carry Load

The 650-million-dollar of domestic business for Boeing Aviations Corp's share of the cost of fiscal 1991 will be spent out among as many as 6,000 subcontractors and suppliers in the form of \$127 million worth of contracts with \$151 million of their gross business.

The firms which make hundreds of components for aircraft and related equipment notes that as defense business increased to 77% of its total sales volume in the final month of the fiscal year just ended.

## Switch Services

Push to let down the bar for telecommunications who want to switch services on in service. At Defense Department's request, Chairman Richard Russell has introduced legislation authorizing random—if the Secretary of the Air Force's severe approves.

Most telecoms probably would be drawn from Air and Navy to USAF which needs offices for an expanded program



## LETTERS

### Stall Warning

In 1947, Airline Weeks advised several airlines to stop using the stall warning device to help them to keep the stall handle from being used for stall communication. Since that time, there has been much protest at this fact. Most airlines and aviation authorities have been equipped with stall warning systems. In addition, the acceptance of the stall warning system has led to the use of multiple radio stations for stall speed control for the leading approach and retarding of jet aircraft.

We point with pride to the record that we have achieved in this field and in particular to the presentation to us by the White House Executive Office of the Civil Aviation, "We're Safe" Safety Award. We also point to the excellent safety record achieved by the almost 25,000 aircrafts which have been made an every type of air craft.

When it concerns safety equipment, the most progressive and most cautious of our members should be the most efficient safety manufacturers. Safety is the most important factor of public transportation.

The extensive value of a good safety record from the standpoint of public insurance and the protection of valuable equipment must be emphasized.

There is no question that the CAA, the ASA and the AIA have done their best in requiring that, as enunciated in para. 907, 47 Air Transport article by F. E. Moore, transport aircraft manufacturers lead the CAA and the AIA are acting in an "all-the-way" fashion by insisting on positive, positive protection. Do they know that we all have been to take a look at the record of occurrence of accidents of transport category aircraft involving stall? There were 15 such accidents, many fatal, listed by the CAA during the period of 1940-1945.

We note in that article that designers and manufacturers are required to "minimize the potential sources of performance which is not dependent under all normal flight conditions. We should like to know what performance there is to inspect this assumption. Do they know that all the major aircraft manufacturers are using stall warning systems? We are using stall warning systems because we do without first retarding themselves to the reliability and performance of the equipment? The record speaks for itself. We have never undertaken the investigation of a potential warning system as any other than a stall warning system. The TRANSPORT CATEGORY, WHICH HAD NOT BEEN INDEPENDENT AND APPROVED BY THE AIRCRAFT MANUFACTURERS.

On the transport category aircraft on which our equipment has been installed, Boeing C-121, Douglas DC-4, Lockheed Constellation, C-46, C-54, C-119, C-124, C-130, C-141, C-145, C-146, C-147, C-148, C-149, C-150, C-152, C-153, C-154, C-155, C-156, C-157, C-158, C-159, C-160, C-161, C-162, C-163, C-164, C-165, C-166, C-167, C-168, C-169, C-170, C-171, C-172, C-173, C-174, C-175, C-176, C-177, C-178, C-179, C-180, C-181, C-182, C-183, C-184, C-185, C-186, C-187, C-188, C-189, C-190, C-191, C-192, C-193, C-194, C-195, C-196, C-197, C-198, C-199, C-200, C-201, C-202, C-203, C-204, C-205, C-206, C-207, C-208, C-209, C-210, C-211, C-212, C-213, C-214, C-215, C-216, C-217, C-218, C-219, C-220, C-221, C-222, C-223, C-224, C-225, C-226, C-227, C-228, C-229, C-230, C-231, C-232, C-233, C-234, C-235, C-236, C-237, C-238, C-239, C-240, C-241, C-242, C-243, C-244, C-245, C-246, C-247, C-248, C-249, C-250, C-251, C-252, C-253, C-254, C-255, C-256, C-257, C-258, C-259, C-260, C-261, C-262, C-263, 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USED successfully in the Navy, the Piasecki HUP will soon be in the Army as the H-25A with more power, better air flowing, cargo tandem, and provisions for at least three lives. To help ensure smooth, dependable operation in the air and on the ground, the H-25A uses Timken® bearings in the fixed and oil transmissions, in the pitch bearing case—especially important in landing wheel applications. Timken also uses Timken roller bearings in the main landing gear, and Timken provides maximum load-carrying capacity. And due to their incredibly smooth surfaces

under the bearing loads, their special construction creates radial and axial loads with minimum deflection and permits reverse pre-loading in any deflection angle. They permit no other gear mesh and reduce wear.

The rollers and cages of Timken bearings have a hard, wear-resistant surface and a rough, shock-resistant case—especially important in landing wheel applications. Timken also uses Timken roller bearings in the main landing gear, and Timken provides maximum load-carrying capacity. And due to their incredibly smooth surfaces

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**PIASECKI HELICOPTER COMPANY** uses a total of 28 Timken bearings in the transmissions, pitch bearing cases and landing wheels of their high performance H-25A helicopter. The result is smooth operation and long life.



### WE MAKE OUR OWN STEEL

The special steel after heat which gives Timken bearings their unique qualities is cast in molds in our own steel mills.

The Timken Roller Bearing Company is a wholly-owned subsidiary of Timken Steel Corporation, 1 advanced design, 2 precision manufacturing, 3 special quality control, 4 research and service.

# TIMKEN

TAPERED ROLLER BEARINGS



NOT JUST A BALL. ■ WE TEST A BEARER. ■ THE TIMKEN LADDER ROLLER. ■ REARING TIRE BEARER. ■ AND THUS... ■ USES IN ARMY HELICOPTERS

## AERONAUTICAL ENGINEERING

### Diesel Power Proving Out in Aircraft Use

- Cylinder head air cells cut peak firing pressure.
- Fuel economy, reduced fire hazard claimed.

By David A. Anderton

A new aircraft Diesel engine, with a novel design feature which avoids high peak firing pressure, has been developed at Daimler-Benz, Inc. of Parsippany. The engine is currently being flown in a Taylorcraft liaison plane. And Dylex-mot, Inc. has made exclusive arrangements with DPL to use any engine built up to 500 hp.

L. M. Brotman, DPL president, says that the design of an air cell in each cylinder head makes his engine run smoother and without sharp peaked firing pressures.

The new engine is of 290 cu in displacement and is equivalent to the Levington 370 cu in made by Levington-Sparton Div. of Avco Mfg. Corp.

On a basis of weight and horsepower, there is no choice between these two engines.

**Crankshaft configuration of the Diesel** is about one-half to one-third that of the gasoline engine.

**Delek Review**—The significant difference between the Diesel and the gasoline engine is the method of ignition. The Diesel requires no spark plug and depends on compression to raise the temperature of the charge air above the ignition temperature for ignition of the fuel.

Fuel, which is reported near peak compression, vaporizes and ignites spontaneously on contact with the heated air.

The advocates of the Diesel engine generally emphasize the fuel economy (first), the reduced fumes in the case of a crash (negligible), and the low cost of fuel (also negligible).

Those who argue against the Diesel generally cite the high horsepower-weight ratio and point out that if Diesel fuel were in great demand, the price would be right up there with aviation gasoline.

Aviation's big argument is that you get two or three times the wind range on one filling of the tank—and that's because the combustion heat content by high-density Diesel fuel is lots more than that of gasoline.



MOUNTED on an Army type Taylorcraft, uncooled Diesel engine is run up for test.



CLOSE-UP shows simple installation. Note absence of magneto, plug, wiring.

**Differences**—Big difference between the engine and the conventional Diesel, says Brotman, is that his engine brems of the expected fuel. His Diesels have a "leak-off" at the fuel injectors which diverts off and returns to the main fuel supply any excess fuel which has not yet ignited.

And in addition, he uses an air cell in each cylinder head. This cell is compressed and loaded with fuel (not air) and that's because the combustion heat content by high-density Diesel fuel is lots more than that of gasoline.

Jet film omega, according to Brotman, provides a rapid transmission of power pulsations until all of the engine's (the cell's) heat content is exhausted.

What results is another unusual, and the absence of a high peak firing pressure.

The high firing pressure has made Diesel engines a very heavy construction in the past.

Says Brotman, "That is why our ... principle is adaptable to lightweight, liquid-cooled engines where the maximum cylinder head load is mostly thermal and should be to the red cylinder burst."

**Conversion**—Johannes Levington 370 engine furnished the basic data for the Diesel engine. The precombustion zone from a larger place which had been cracked up, so other engine was

available at the time development started.

Barton underscores the statement that the line is not intended as commercial. The Lycoming was used to prove principles at a convenient rate. Barton set out to show that the Diesel cycle, as modified by his firm, could be applied to a high-bypass aircraft engine without any changes in basic design of bearings, connecting rods and other mechanical parts.

DPI designed a custom power plant to attain the compression ratios. And they developed and fielded new heads for the cylinder.

The engine was taken from the test

bench and installed directly in the plane. Consequently none of the final design refinements ever did get on the flight article.

One example is the use of ordinary rubber hose for the fuel supply lines. These are bulky and would normally only be used on test stands. A carbon fiber filter was mounted on the rear end of the drive shaft for protection against engine oil.

► **Test Purpose:** Object of the current flight tests at Pittsburgh is not to test the engine, it already has 1,500 hr. of operational time. Instead, Barton is accumulating data on fuel consumption

### Specifications

• Number of cylinders, cyl	1
• Bore	4.5"
• Stroke	12"
• Horsepower at 3,600 rpm	100
• Horsepower at 5,000 rpm	125
• Approximate weight (dry)	265 lb
• Compression ratio	16 to 1
• Fuel injection pressure	1,120 L/580 ps
• Fuel injection pump	Each V4
• Ignition module, share spark	1
• Lubrication system	External
• Starter	Compressed air
• Displacement	390 cu in

with a wide variety of fuels and blends which are commercially available.

An outgrowth of the test program, final recommendations are to limit 90% burn of alcohol. For example, the Lycoming 4-180 was about 90 mph at cruise. With common kerosene the Diesel conversion rate is about 44 mph, and with a heavier common Diesel fuel has shown a consumption as low as 3 mph.

Another interesting result has been the lowest cylinder head temperatures. No. 1 cylinder—which in the Lycoming ran at high as 425° to 450°—stayed down around 310° in the Diesel until shown.

Thus far it has been found that DPI's modification of the Diesel cycle has resulted in decreasing the shov jerk factor.

This promises a new life span order of magnitude at the compression end of the engine.

► **Test-Yard OEM:** Current status of the engine repeat tests of 12 com<sup>2</sup> displacement which started with early studies by Fred Thibell, the patents were issued by and assigned to Diesel Power, Inc.

Development of the test engine was completed in 1976, but the part was mounted on a testbed, put very further down the road.

Diesel Power turned to tank engines, and as one result of that change now has a 150 hp, water-cooled liquid-cooled engine, on the test stand.

Work on the aircraft engine was started several months ago under a contract with Taylorcraft Inc., which calls for production of a group of engines for Taylorcraft Inc. Anticipated production during 1982 is 900 units for Taylorcraft.

Diesel Power's headquarters is in Los Angeles, where the innovative engine work is situated.

The firm is also engaged in work on the Taylorcraft plane at the Canopy Pittsburgh plant at Canopy, Pa.

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No Down Payment—if you trade in your  
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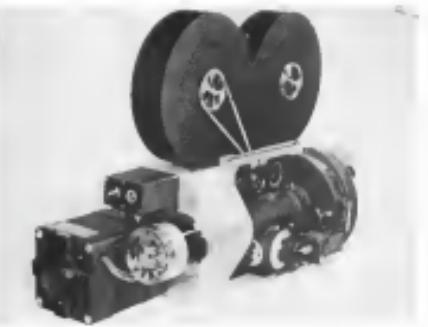


They are typical of the skilled men you'll have working for you when you use Harter as a subcontractor. Particularly if you have special constant, you'll appreciate the certified strike welders and the experience in ingenuity responsible in the Harter production team.

A tradition of craftsmanship has made Harter chairs synonymous with quality. This also makes Harter a good bet for you if you need more capacity for formed parts and assemblies of steel, copper, aluminum or alloys of these metals.

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NEW MAIER Servo-Sync camera does mounted on back of 25 in. cart carries camera

## Servo Drive Puts Cameras in Step

**Analysis of photo data is made easier by device which**  
**accurately synchronizes all units connected with it.**

Photo synchronization, long since available in the amateur field, is now being implemented by J. A. Maier, Inc.

The device, designated as the Maier Servo-Sync Camera Drive System, was designed by Opticon, Inc., of Sapperton, Conn. At present, the design is applied to the Bell & Howell Standard 35-mm. motion picture cameras, but it is easily adaptable to many other cameras.

And any number of cameras can be fitted to a cable. The only on the growth of the cable link (the men in the air), can be reduced to an air slot.

Maier says that the maximum possible shutter duration is only 230 microseconds at a film rate of 12 frames per second. This is an accuracy of about 1/16. Other frequencies produce similar or better shutter times.

**► The Position**—In many jobs of data recording, the requirement shows data variations with time. And that time variation is important, because it serves as a common basis to which all data are referred.

In this past, a typical installation needs to be set up (photocell would face a clock mounted on it and the range of the clock would be photographed by the recording camera. Then the data would be plotted against the

time index. A time differential of only 210 microseconds (measured over a period of time) between the start of recorded data and the end enough to be used with most physical happenings—excepting some combination of explosive phenomena, for example.

**► The Solution**—Stringing out of the new Servo-Sync system is a Bell & Howell Model 1719 35-mm. motion picture camera. This particular camera is generally known to have reliable optical and electronic frame registration. Its film capacity is either 400' or 500'.

Heart of the Maier system is a control unit which provides all the cameras with reference data. The control unit is basically a synchronous motor driving a tachometer generator at a desired frame speed. Drive is through a gear change and.

Each camera has a reduction motor and gear unit which appurposes the rotation of the control unit. The angular position of the control unit shaft and the camera unit shaft are connected mechanically. The tachometer from each camera is applied as a speed to a servo drive system. Through a differential drive, the error is continuously reduced toward zero.

Basic link synchronization can be provided by other position-error devices. For such a cap, all the necessary data can be transmitted over a single channel modulated at audio frequency.

The Servo-Sync system operates on 110-v. 60-cycles, direct current. Weight of the control unit and unit is 30 watts, each camera draws 70 watts.

Electrical interconnections require four wires.

The camera and drive unit, weighed one a 400'-ft. film magazine, weighs about 46 lb. The complete assembly is 3 ft. high, 9 in. wide and 18 in. long.

Further information can be obtained from J. A. Maier, Inc., 3705 Mt. Saint, Long Island City 1, N. Y.

## Small Unit Checks Noise Spectrum

Just how noisy is your office, or your shop, or your flight line?

One of the best ways to find out is to make an analysis of the noise spectrum, just not an overall decibel level reading. And one of the most popular for this is the G.R. Goss Model Radio 100A, 100-B, or 100-C. Overall Radio 100-B.

G.R. Goss' analyzer is recommended for applications where great detail is not required in the analysis, and where reasonably continuous spectrum analysis





ment. With this configuration, there is lower fuel consumption for the same power of the basic engine, or higher power with the same fuel consumption. Power at cruise increases as up to 25%, it is reported.

First flight of the prototype was on an extra engine in the nose of a B-7 flying lab, as described. It first flew in the PIVI Neptune on May, 1959.

Considering the relatively short time in the Neptune, the inventors' test would seem to be a good one, because already one complete PIVI engine has been test-flown to 1,000 hr on the engine between overhauls.

Reporters say that for a new engine development, the Turbo Commander is relatively free of "bugs," very few faults having shown up, and those having been resolved. Ideas concerning design and basic construction in the Neptune have been incorporated with a new configuration design of the variable type. The tasks which are reported to have given so difficulties—Through efficient coding, Wright has brought basic operating characteristics in the engine down to about 9.8°F and one propulsive moment—commercial experts feel that the wheels will have an acceptable service life.

►DC-7. Figures—Dougherty says that the DC-7 for American will have a top speed in excess of 480 mph and a nonstop running speed of more than 360 mph—50 mph faster than the DC-4. When we calculated figures, American's figures were:

The engines, like those in the Super Constellation, will be the Pratt & Whitney R-4360-34s and the prop on the DC-7s will be the three-bladed four-bladed, 152 in. diameter. The plane will be 40 m. longer than the DC-6B will accommodate 60 passengers, plus no lounge seats in the de luxe version and up to 95 passengers as the coach version. Pressurization will afford sea level conditions at 12,500 ft., 5,000 ft. at 20,000 ft. altitude, and 8,000 ft. at altitude of 25,000 ft.

The domestic transocean version will have a gross weight of 132,000 lb. and maximum takeoff weight of 142,000 lb. Fuel, Domestic version will have a maximum takeoff of 122,200 lb. and carry 6,000 gal.

►Specifications—Here are the DC-7 specs:

►Dimensions: Span, 117 ft. 6 in., length, 105 ft. 11 in., height, 28 ft. 7 in.

- data: Wing, including ailerons, 1,663 sq. ft.
- Weights: Maximum takeoff, domestic version, 116,800 lb., overseas version, 122,200 lb., structural, design loading, 95,000 lb., payload, 20,000 lb.
- Level flight speed: With max. continuous power, high blower, critical alt. at 10 mph at 95,000 lb. at 21,000 ft., 901 mph; at 105,000 lb. at 26,000 ft.
- With max. running power, high blower, critical alt., 370 mph at 95,000 lb. at 14,500 ft.; 358 mph at 105,000 lb. at 24,200 ft.
- Stalling speed: Landing configuration at sea level, 99 mph at 95,000 lb. gross.
- Rate of climb: 4-engine max. at sea level, 1,820 fpm at 95,000 lb., 1,535 fpm at 105,000 lb., 1,260 fpm at 135,000 lb.
- Coring: With max. continuous power, 4 engine service ceiling, 25,290 ft. at 95,000 lb., 26,700 ft. at 105,000 lb., 24,700 ft. at 115,000 lb.
- Landing: 7,000 ft. CAA field length at S.L., 5,405 ft. at 95,000 lb., 3,222 ft. at 105,000 lb., 5,673 ft. at 115,000 lb.
- Landing: CAA field length at S.L., 5,510 ft. at 95,000 lb.
- Range: Absolute range at 18,000 ft., with 4,512 gal. of fuel, 3,625 mi., with 6,600 gal., 3,510 mi. Absolute range at 20,000 ft., with 4,512 gal., 3,590 mi., with 6,600 gal., 3,175 mi.



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## IAS Summary

- Society hears 48 papers during five-day meeting.
- First group of digests is printed in this issue.

Last week's 20th Annual Meeting of the Institute of the Aerospace Sciences proved to be the longest and most comprehensive that the organization has yet held. Total of technical papers presented was 48 and the customary four-day sessions were extended an extra day this year—primarily to take care of the volume of papers on stress.

For the second successive year this technical category has been given top emphasis on the program and at this meeting was broken down into three general classes: (1) design of aircraft frames, (2) analysis of aircraft frames, and (3) aircraft operations problems. This last phase was the subject of a symposium having nine panel members, including flight representatives from airlines, the Navy, Civil Aeronautics Administration, Air Transport Assn., Sperry Gyroscope Co., and personnel from Cleveland airport.

Another feature of the meeting was a joint session on rocket propulsion in cooperation with the American Rocket Society, including that organization's results of work on solid fuel rockets available in future test meetings.

Monolithic Rigit (analog) spans will back in the picture with up-to-date problems under analysis. This session was held jointly with the Stress Society of America, Inc.

Aerodynamics, an important anchor in the annual meetings of the Institute, took on an unusual extensive role with a wide assortment of high-speed aerocases.

The remaining categories included aerodynamics, structures, circuit design, rotors, wing sound, radiography, safety in air transport and flight problems.

As a tribute to those in the industry who could not attend the meeting, AVIATION WEEK began here the new section of the paper devoted to the technical sessions. Other papers will be handled in succeeding issues.

### Aerodynamics

- Calculation of the Stability of the Laminar Boundary Layer in a Compressible Fluid on a Flat Plate with Heat Transfer E. S. Van Doren, Aerodynamics Research, Aerojet General Laboratories, North American Aviation, Inc.

The Cross Method of Raytracing Laminar

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## Structures

► A Review of Current Analysis Methods for Single Wing Structures. M. L. Wilkins, Assistant Professor, Guggenheim Aeronautical Laboratory of the California Institute of Technology.

Several proposed methods for estimating static strength analysis are reviewed with the aim of establishing the knowledge necessary to the design of aircraft wings. The methods of subsonic linear theory, the characteristics of the tape are the best known and are best. However, the methods are not particularly applicable to tail buffeting since the results are incomplete.

Still, the present scheme developed does not have the characteristic features of the problem and, in addition, is applicable to general problems.

A description of some linear load methods at the Guggenheim Aeronautical Laboratory to develop and verify these ideas is included.

## ENGINEERS NOTEBOOK

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boundary layer analysis is first reviewed. The method is applied to the calculation of skin friction and heat transfer coefficients and transonic, subsonic, and supersonic flow. The results are presented for the transonic flow around a flat plate, Mach numbers up to 2.3 and skin friction temperature ratios of 2 to 6. The Prandtl number is taken at 0.75 and the Schubert viscosity temperature law assumed.

It is found that the amount of cooling necessary to stabilize the boundary layer increases as the Mach number increases and that heat transfer is not proportional.

In fact, above about Mach number 9, it is impossible to completely stabilize the layer with any practical amount of cooling.

Use of the stability results in mode superposition heating analysis is illustrated by means of V-T light temperature data.

► A Flight Investigation of the Effect of High Reynolds Number Supersonic Laminar Boundary Layer. Joseph M. Lighthill, Chairman, Wind Tunnel and Stability Division, Research and Technical Division, Bell Telephone Laboratories, Murray Hill, New York.

A modified V-2 was used at Goddard, 1955, at Mach 3.5 in order to determine whether, under favorable conditions, laminar flow could be maintained at the high Reynolds number which was possible. The test area was the surface of a special polished 20 deg. is chord angle model nose more than eight feet long, which replaced the standard V-2 nose. The model reached Mach 3.5 at 34,000 ft. in ground-supported flight lasting 41 seconds. The aircraft was Mach 3.5 at the beginning of the test. With the large thermal inertia of the 20 ft. chord size, the skin temperature lagged well behind the boundary layer recovery temperature.

Consequently, during most of the supersonic portion of the flight, the heat transfer from the air to the surface was greater than that required to drop small boundary layer oscillations according to Laminar theory.

Measurements of the nose skin temperature and of total pressure on the boundary layer were made at the end of the test, and the data are in excellent state of the boundary layer.

Pressure and temperature data indicate that the nose boundary layer was laminar at an upstream free stream Reynolds number of  $3 \times 10^6$  which was the highest Reynolds value obtained on the nose.

### Aeroelasticity

► flutter Analysis of Complex Airplanes by Experimental Methods. T. R. Sekhon, Keweenaw Metal Corp., Calumet, Mich., Boeing Airplane Co.

The problem of the flutter proneness of high aspect ratio aircraft having a large number of mass ratios distributed along the span has proven to be susceptible to analysis by the use of statically and dynamically scaled wind tunnel models. Experimental flutter testing of Boeing's proposed transonic transport aircraft model of 1/144 to model aircraft critical stability factors

models tested in a suitable condition of free flight.

Continued development of exponential flutter analysis techniques and methods with full scale flight instabilities are needed to prevent more severe problems in the future. The methods studied at the time of the meeting were found to be of little value in the final design and flight stages of the craft.

► An Approach to the Buffeting Problem from Aerelastic Considerations. H. W. Lighthill, Chairman, Douglas Aircraft Co., Santa Monica division, and Professor, Guggenheim Aeronautical Laboratory, California Institute of Technology.

The study is intended as a step in the development of an understanding of the problem of buffeting. The problem is considered when the wake of some part of the airplane structure interacts with the tail surface or happens, for example, during the stall.

► A Description of Some Wind Tunnel

Tests on the Guggenheim Aerodynamic Laboratory to develop and verify these ideas is included.



## Sweden's Saab 210 Draken Jet Delta Takes Off

(McGraw-Hill World News)

Stockholm—Sweden has gotten off the duffing act with the announcement of the Saab 210 Draken, an experimental flying wing. First flight was made from the Saab airfield in Linkoping, Sweden.

Stockholm—Sweden has gotten off the duffing act with the announcement of the Saab 210 Draken, an experimental flying wing. First flight was made from the Saab airfield in Linkoping, Sweden.

From the subdued voice of the triangular slab, a living line runs and breaks into the wing leading edge. The duration of this line in the photo seems to indicate a different type of delta-wing platform. This one could be two triangles encompassed by a horizontal line, and the other of vertical lines.

Upward deflection of an enclosed surface control lever? I don't know the part. That appears to be a fixed wing flap deflection during landing. One conclusion therefore is that the

Saab 210 uses the three friends in the three 707 series of delta-low wing loading and lift.

At the end of the tricycle landing gear actuated forearm, it appears that the main wheels rotate through a 90 deg. angle to be flat with the wing.

Just below the saddle is a fixed canard which contains a parabolic used for locking and presumably for spin recovery. This is standard practice in most of the current delta-wing craft in operation.

Sweden's first effort in the delta-wing field is an attractive design. Great credit is due the Saab Aircraft Co. for developing the type. However, the conventional results of the tests made should not have been published, so that corresponding trials have to be made in Sweden as well. . . .

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(Continued from p. 31)

It is concluded that, if the structure is isolated and is not the shear stress type (plus rapidly existing windload), it can in some cases be analyzed by applying an existing analysis methods now available.

Another very important point remains to be accomplished before the optimum strength solution itself can be specified.

► A Method for Reducing the Analysis of Composite Reinforced Structures to a Few Parameters. L. W. Walsh, J. S. Bunnell, Analyst, and W. Lanning, Structural Engineer, Ginnan Aircraft Engineering Corp.

A general method is given for the analysis of initially inextensible structures based on minimum stress energy. Matrix methods are then developed.

The procedure details the mode of analysis of three types: (1) the setting of the parameters which determine the load distribution in the structure after it has been under static load; (2) the calculation of the influences of the individual parameters on the stress; and (3) the self-checking matrix operation which can be performed in a shorter time. In case studies with plane (2), formulas and curves are provided for some of the elements most frequently in aircraft aircraft stress analysis.

The method has been applied to the design stage to various components of several modern aircraft. For the purpose of demonstration along these lines, a simplified example is worked out in the paper.

Load distributions and determinants that are used are described and the method of calculating the most portion of a revised weight loss using the stress and force provided

### Motorless Flight

[Part Seven in Cooperation with The Society of Automotive Engineers, Inc.]

► Cross-Country Soaring Club's Based on Thermal Research by B. H. Carruthers, Chief year Aircraft Corp. Co.

The equation for effective cross-country speed is developed in terms of initial airspeed velocity and the airfoil performance of the wings, where the latter is generally considered to be the primary factor of performance. Fractional Diffusion gives the relationship between optimum glide speed and the meteorological conditions.

Where optimum glide speeds are computed, the resulting speed of best glide ratio is determined as the minimum value of the first derivative of the effective speed. Optimum values of the parameters as a function of the meteorological conditions are converted through the aerodynamic qualities of the airfoil to yield optimum velocity.

By combining optimum values of wing loading with optimum choice of flight speeds, the ultimate possible effective cross-country speeds are determined as a function of the maximum glide ratio.

The use of optimal flight speeds to compute landing points in the path of a cross-country flight is a valuable aid to early territory identification of the use of tailwind for aiding the wing loading to best meet the existing meteorological conditions.

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and do not depend on keeping the boundary layer laminar.

\* How Separation Affects the Blunt Bodies at Supersonic Speeds (TN 2485)  
—by W. E. Mueller

This paper contains the first problem of a number of supersonic studies and for the case of nose sections exposed to supersonic streams with no boundary layer transition. The author discusses how supersonic flow considerations that the form of a delta air region influence of boundary layer or wake should be a subject for two-dimensional flow and a code for easily supersonic flow. The purpose of the paper is to investigate the nature of the equilibrium that determines the area of the separation region, and the location beyond which the separation cannot exist.

Quantitative analysis of the flow indicates that for the Mach number studied there is a minimum relative body shock wave beyond which separation regions cannot occur. This minimum shock wave is large for high Mach numbers but it approaches zero for a Mach number of 1.

Qualitative agreement was obtained between analysis and experimental results for the Mach number range of 1.73 to 2.62 as the case of two-dimensional flow around blunt bodies is discussed on a flat plate.

\* Evaluation of the Reduced-Mass Method of Representing Wing-Lift Data in Fixed-Bed Drop Tests of Landing Gear (TN 2486)—by Beaupre, Maietta and Dunn, G. Lindquist

The adequacy of the drop test as a design criterion for landing gear has been open to question because of the non-uniformity of aeronautical lift forces. Current aerodynamic computations predict drop tests to be conducted with reduced weight as a simple means of approximating the effects of wing lift during landing. The aim of the drop-test weight is selected so that the impact energy is equal to the energy in an aeroelastic landing of the same descent velocity.

A full landing gear was checked in the Langley research tower to check the validity of the reduced-mass method. Thus it was possible to compare data taken from several aeronautical impacts and full-scale drop tests with full drop-test weight to the reduced-mass drop test.

It was concluded that the reduced-mass method of drop-testing landing gear gives somewhat conservative results, but it more closely approaches the results of aeroelastic landing.

If a landing gear has a required track in the transition of drag loads to wheel drag, it may be necessary to match wing lift by aeroelastic means.

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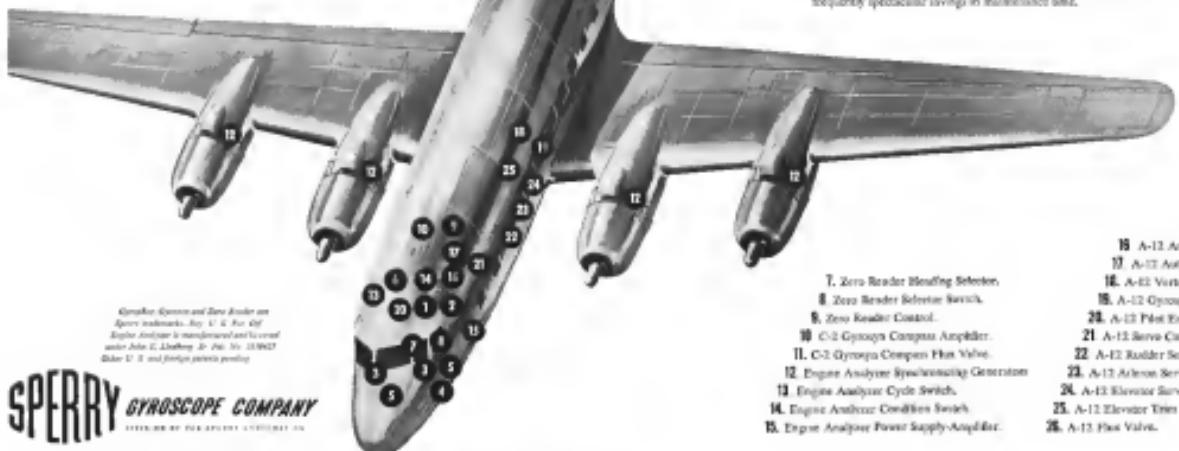
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## AVIONICS

# Faster Reacting Autopilot for Speedy B-47

- Control time is cut for bombardier over target.
- Gives enemy less time to "zero-in" on bomber.

By Philip Klass

The Air Force's new Boeing B-47 jet bombers should be safer from enemy fighters and fast in a series of recently announced improvements in armament, pilot. These improvements also mean that today's 500-mile bombers could drop their loads more accurately than could their World War II predecessors, which flew at less than half the speed they do.

Most likely in the decreased vulnerability and improved bombing accuracy is the greater pilot response of the new B-47 autopilot. This makes it possible for the bombardier to approach its target more closely, using evasive action, before being committed to a straight and level bomb run by its bombardier.

► **Setting Down.**—When a bombardier is on his bomb run, it would naturally want to make certain his bombs will hit the target. Observing fighters see that a bomber is so committed to a bomb run than he can't plan and execute other attacks. For the same reason, a ground-based antiaircraft information post finds its task much easier when its target zone follows a setting sun, pattern of flight.

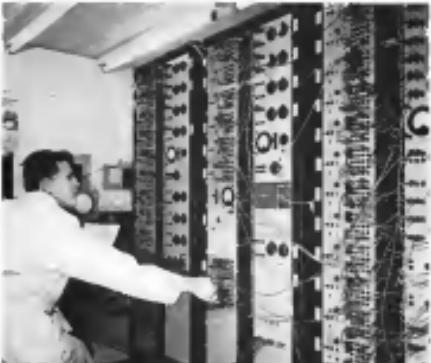
By reducing the length of time required by the automatic pilot (under bombardier control) to make corrective changes in aircraft attitude or flight path, the bombardier can make his attack faster. Furthermore, the necessary corrections in attitude or flight path can be corrected more quickly to place the bomber in the proper position at the time of release.

Boeing says, for example, that a 5-degree change in bomber heading, size taken only half as long as it did previously.

► **B-29 Experience.**—During World War II, B-29 bombers' crews were at first opened and closed by fighters without much difficulty. However, as the fighters moved closer to the bombers, the fighters would reach an evasive or evasive operation. The nearly unannounced improvement is a result of an overhauled "go/no-go" panel so sensitive that the planes were refitted with pneumatic



NEW AUTOPILOT should make the B-47 a less vulnerable target for enemy fighters and fast during bombard runs. Bomber shown, shown again, an extended bombload.



ANALOG COMPUTER: shown being converted up by a Boeing engineer. It is used in solving some of the extremely B-47 autopilot-airplane stability problems.

device for split-second operation of the bombardier doors.

► **Not Free-Swinging.**—Speeding up the response of an automatic pilot isn't as simple as it sounds. Improper response by itself, without control stick to the overall system, can lead to a "free-swinging" condition, where the aircraft would pitch, roll, or yaw uncontrollably. These conditions are usually tackled by adding up to four large weights, speed indicators, hydraulic actuators etc., to duplicate faithfully the airplane's flight control performance.

► **Autopilot manufacturers.**—including Sperry Gyroscope Co. and Metric Avionics.

Previous analytical studies of the implement-autopilot performance under varying conditions were made using analog computers and flight control simulation. These methods are usually lacking devices capable of large weight, speed indicators, hydraulic actuators etc., to duplicate faithfully the airplane's flight control performance.



AVENGER CONTROL simulator contains B-47 controls. Hydraulic actuators, foreground, apply simulated deflection forces against which autopilot uses attitude work.

about review, pitch, roll, yaw. A single, static stabilizer is substituted for each axis. When used with an autopilot, which servo actuates drives the control surfaces, and with a digital computer, the autopilot can determine and correct such effect on B-47 performance until small large changes in autopilot characteristics.

► **Gyro sensor.**—Gyro-Unit, USAF, has modified autopilots to overcome manufacturers telling them which type to use. The previous gyro has been overridden in the case of the B-47, when fitting along an autopilot of its own selection, subject to USAF approval. The complexity of integrating the airplane, autopilot, and bombardier equipment in a high-speed jet bomber has led to this decision.

The first Boeing autopilot was

made on a modified B-57B E-6 autopilot. It is currently used on B-47s. Boeing's decision to switch to a Sperry autopilot for the B-47B may in part have been influenced by a system integration problem. Sperry also builds the bombardier for the B-47. If their selection is the autopilot supplier, it would appear to simplify Boeing's system integration problem.

The most extensive Boeing tests were conducted using a Sperry autopilot.

The Air Force uses a standard Sperry E-4 autopilot on most of its bombers and transports. However, the Sperry A-37, the refit autopilot which was developed during the F-86, was considered a better starting point for the advanced autopilot required for the B-47. The improved autopilot is called the A-120.

► **Modifications to A-12.**—Modifications in the A-12 design include the use of navigation signals on all three sets Sperry had previously used such signals

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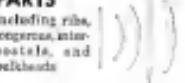
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# PRODUCTION

## Mill Will Speed Tapered Sheets

New rolling mill will mass-produce sheets up to 10 ft. wide and cut time and chip wastage of slab milling.

By A. H. Langreth\*

A new rolling mill for tapered sheet, expected to be placed in production in the middle of 1953, will be able to mass-produce tapered sheet up to a width of 10 ft.

Currently in the construction stage, the mill will be a 146-in.  $\times$  4-in. high, 40-ton unit. It will have parallel steelwork deformations and eccentric. Maximum sheet thickness will be 1.50 in., maximum thickness will be 6.00 in. Maximum taper rate will be 1/16 in. over a maximum taper rate of 0.093 in. per ft. The maximum gauge tolerance will be pegged at plus or minus 5 in.

Involved in development of the new mill are Al Marval Company, Reynolds Metals Co. and Alcoa Company of America. When the mill is built, it will go to Alcoa, which developed the controls, for use at its Davenport, Iowa, works. AMIC has set aside \$6 million for the project.

► **Working Slabs**—In current aircraft design practice, the skin shell is a highly stressed, thin-walled structure. In some cases, this stress is not evenly distributed over the entire surface of the wing, tail or other component, but is higher in the leading edge area and increases in magnitude toward the trailing end.

It was only logical, therefore, consider using a skin of variable thickness, one that is thicker in the areas of high stress and thinner in the areas of low stress. Earlier attempts to avoid this condition had been abandoned because of the difficulty of controlling the process. This was not satisfactory because it is a natural, a number of end-use products, and complicated the cutting of sheets of different thicknesses by requiring either a slitter or an offset beam. Neither of these precision did not achieve the maximum weight reduction desired.

► **Further Attempts**—The next step was to fabricate the skin out of sheets which were individually tapered. Since no method had been devised for producing tapered sheets, it was necessary to taper them out of straight sheets or plates to large thickness. For a typical tapered sheet, the volume re-

duced off and converted into chips can weigh up to 40% of the original sheet. While this method produces tapered sheet, it has many disadvantages. The machining operation is very expensive as man and machine hours, being low, is high, there is difficulty in collection and return of chips, and the disposal of the chipping on one or both surfaces.

In spite of such adverse conditions, the sheet producers, the type of equipment required to do the tapering consists of a number of straight, with maximum weight. A comprehensive survey of the potential usage of tapered sheet was made, with the result that the economical production of such sheets in commercial quantities was considered highly desirable.

A review of possible methods for quantity production led to the decision that rolling would best meet the demand at lowest cost and with maximum efficiency.

► **Adaptations**—It was determined that a conventional rolling mill can be used, in which the system of the roll structure contains a workpiece with the roll roll velocity. This means that the control system must operate in such a manner that the speed of the workpiece rotates in a constant proportion ratio to the speed of the roll drive motor.

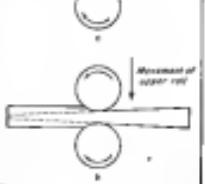
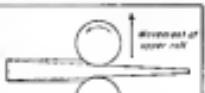
The upper work roll thus moves up or down at a constant ratio to the lower roll, thereby increasing or decreasing the thickness of the sheet.

Earlier methods, for accomplishing this condition included three parallel hydraulic, air pressure and electrical.

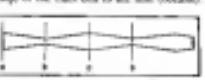
► **In the hydraulic system**, a variable delivery pump is placed directly to the main roll motor, so that the hydraulic fluid output is in direct proportion to the roll speed. This link is fed through a suitable arrangement of check valves, and various pumps to a master cylinder. There are two of them to a main cylinder and cylinder, one between the pressure block and roll block at each hubbed areas. A microswitch device provides accurate control of fluid flow to main or lower roll motor, according to the taper required in the primary sheet which is being rolled.

► **In the electrical method**, an elec-

trical mill will be expensive and may cost 40% of volume in chips (tapered material).



► **ROLLING** the tapers should be change, can be done from the thin end to the thick (top) or the thick end to the thin (bottom).



► **CYLINDER ROLLING** of a long strip, by end at high and low points, can be used to give large numbers of tapered sheets.

front thickness gauge (normally used to measure surface thickness) is required to monitor surface thickness, a master cylinder is used to control the up or down movement of the roll as proportion to the speed of the sheet passing through the rolls.

► **In the electrical system**, a variable voltage generator is direct-connected to the work roll motor. Current is generated from a primary through a series of resistors, capacitors and bridge rectifiers so that the voltage delivered to the work roll is directly proportional to the speed of the roll speed. The voltage of the potentiometer device determines the speed of the servomotor motor, thus controlling the type of the sheet being rolled.

► **First Passes**—Initial runs were made on a 20-in. pilot mill, starting with soft alloy (28) steel, followed by 345

\* Industrial Relations, Al Marval Co., Atlanta, Ga., WIRELESS-PULVERIS APC, Dallas.

Ryan activities bracket many fields, resulting from development of subminiature electronic equipment to manufacture of large external fuel tanks and fuselage sections... from conventional aircraft planes to high-speed jet aircraft and new applications of jet propulsion.

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## EQUIPMENT



SEVEN DC-6As freighter have been ordered by Flying Tigers. Total cost: \$7 million.



## Tigers' Fleet Doubled in Year

Purchase of seven DC-6As will bring freight airline's plane total to 44; overhaul facilities, shops expanded.

By George L. Christensen

**Burbank, Calif.**—The freight is rolling bottoms. The Flying Tigers' fleet of 47 planes that at first the world's largest freight and charter airline, recently announced: "The freight angle paid off" of new planes. **Overhauls**—Wrote Oct. 20, 1951, P. 78: "Seven DC-6As costing over \$7 million." This will bring the Tiger fleet to 44 planes.

But that is not all.

• Fleet size was doubled during the last year.

• Traffic has tripled.

• Load factor improved from 70.1% to 82.3% in June, 1951, percentage was 94.6.

• Shops and overhaul facilities, since have expanded 100% and a new hangar has been put into operation.

• Capacity for outside customer work has been expanded.

• Maintenance has been more than doubled—current machine work force now stands at over 700 men.

The Flying Tigers line does not confine its activities to flying freight and contract operations. It now has been in a Civil Aeronautics Authority approved overnight line for all aircraft activities except the overhaul of engines and propellers, according to Al Gold, Flying Tigers' vice president of administration. And, he added, the last 18 months have been spent in striving hard to become completely self-sufficient by becoming as efficient as possible those jobs which it now has to haul out.

• **More Power**—Since the airline operates a fleet of 26 DC-6s and 12 C-47s, it has a very real interest in squeezing every bit of horsepower out of its air craft powerplants. The need for more power is underscored by the fact that the Tigers operate the planes with heavy loads out of such high altitude airports as Spokane, at 5,000 ft., where the C-47 can be stalled when taking off on hot summer days.

• **Analysis**—Analysis, both the Scientific Aviation and the Savoia engine types, are under scrutiny by the Tigers.

R 2000B. If the experimental results, it will be the first ADI installation on that model engine mounted on a C-16, 40 standing to PWAs.

Goldberg told AVIATION WEEK that he is also investigating higher tailwind and cross winds. While the ADI improves, or hopes to achieve a 10% increase in the engine's 2,000-hp. takeoff and 1,700-hp. climb power.

Two Tigers have devised as passengers and handily fast tool to conduct the necessary pricing mark on the engine is obtain CAA-type Ingersoll-Armstrong for both ground and flight test passes of the engine.

The engine is extremely powerful, developing 5,470 lb. of thrust at sea level. The test engine will have a torque, more, will remain 50 thermocouples, one on the rear spark plug and one at the base of each bore. The 60-gauge carburetor will accommodate water injection.

• **Leased Power**—The Flying Tigers were the first to convert into a "Leased Power League Contract Agreement," according to Fred Giese, the carrier's Chief Inspector.

Under that two-way scheme the carrier would rent out its engine overhauled aircraft, the Tiger pay the agency \$10,000 to carry home the engine operators after overhaul, and the carrier would be given a sum amount at a flat rate to make the next scheduled period (1,700 hr.). Thus, it is \$10,000 should 1,800 hr. be used; on next period, the carrier would receive a \$1,500 credit.

• **Advantages**—claimed for this system

• Overhaul costs are to be predetermined with ease, avoiding setting up separate time factors.

• Overhaul agency becomes unusually goodly concern, resulting in better engine.

• Consolidation and cooperation between engine and overhaul agency are greatly improved.

The scheme is now to firmly ground itself in the industry through experience with the C-46.

• **Around the Shop**—The Tigers have developed a high-speed maintenance panel for the C-46 with which instruments are being conducted. Red light is used.

• **Tool scaling**—Considerable success has been achieved with aspiration-type fuel tank refueling. To repair major leak a 10-in. hole is drilled through the outer skin in the vicinity of the leak. A water-dispersing, fast-drying, thickener compound (Product Research 511B) is forced through the hole to the cavity between outer and inner skin or between skin and insulation. Compound dries quickly and effectively stops most tank leaks.

• **Analysis**—Analysis, both the Scientific Aviation and the Savoia engine types, are under scrutiny by the Tigers.

Three C-47s have been used for the research. Scientific and what is apparently hand-verified according to Goldberg. The Savoia engine research is being conducted as an in-house installation for the aircraft's own DG-530 • Engines. The owner's R-2000 C-94 engine will undergo modification from the -7 to the equivalent of the -13 model. Goldberg said that the result will be a 10% increase per engine, enabling the plane's rated weight to be increased from 30,000 to 32,000 lb. Utilization of C-94 is at a high 15.7 to 1. • **Seating**—The Flying Tigers aircraft was probably one of the highest-density aircraft in existence last year. It reported 190 seats in a DC-4. Since, recently, the CAA limited the number of seats allowed in DC-4-type aircraft to 81.

• **Conversions**—The carrier recently received a plush job which had belonged to President Alfonso of Mexico as a utility craft. Ship had two defense side rooms, gun nests, rear storage spiral stairs, an liquid day, refrigeration, ice, and was floated off in an intact condition.

• **Loadings**—A large metal pallet of 6,000-lb. capacity in freight loading was built by company personnel. The pallet is hoisted to plane level by a special lift bed truck to expedite loading and unloading. The surface finds the pallet/pallet confinement to be a great time-saver.

• **Established**—C-46 spares being available, Tiger maintenance crews have had to build rigs to fabricate from scratch the parts of such control panels and tool boxes.

An unusual circumstance exists at the Tiger's central base every engine is stored in the engine bays and previously sealed in a sheath on the floor, according to company officials.

• **Right & Reliable**—Goldberg finally describes his company's job as a "tough and reliable operation." His emphasis the last few months a freight line is a freight on responsibility. The plane line, from which when it is unloading when loading, is a freight line. Yet the carrier has an 11,000-hr. total load placed on its C-46s and 8,000-hr. on the C-47s.

In the six freight bays you can a integrated operation with integrated loads. Some of the more popular are loaded by the Tigers are master stacks (when volume, incidentally, is increased specifically from 2,514 to 40,274 lb. in the last year), immobile machines, electronic computers, one metric and tank preparation drugs and pharmaceuticals, and wild animals.

The airline flies this in a typical day with the Tigers:

- 12 aircraft flying the domestic freight system, ensemble-cost.
- Six aircraft participating in the Pa-



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TWA has, to date, conducted tests on only a small number of stations but expects to expand use of the IBM reader soon.



### Fast Starter for Nene 4 Turbojet

A new, lightweight, replacement unit for the Rolls-Royce Nene 4 turbojet aircraft engine has just been put on the market by The Pleney Co., Birstall, England.

A cartridge-type unit, it stores six "starts" which permit three starts to be made without refueling. Total energy output is 64,000 ft. lbs., delivered in a working period of two seconds.

Pleney say that 90% of the total weight of the unit is in the storage area, which is equivalent to the time it takes rolling speed in under ten seconds.

Starting is accomplished by depressing a button on the master control panel. The unit regulates the sequence and timing of such operations as closing the throttle bypass when the engine has attained rolling speed, and prevents damage if starting is attempted when engine is running at high speeds.

Cartridge gases are detected through two diaphragms which respond to pressures of up to 1,000 psi. Peak speed of the turbines is 15,000 rpm, giving an output shaft rate of 8,750 through reduction gears.

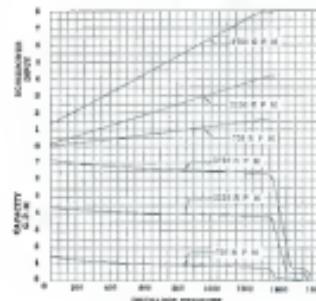
A multi-plate clutch is incorporated to absorb peak loads at intervals of engagement of start in engine and an over-speed device protects the machine in case of drive mechanism failure. Ballons oil pump lubricate the bearings.

The Pleney Co. believes it has solved one of the most difficult problems in turboshaft starting, eliminating the need for a separate fuel tank. After 700 starts without replacement of a single major component, there is three times the life of the type test requirements, according to the manufacturer.

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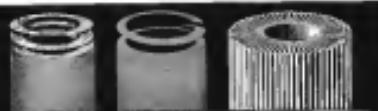
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## NEW AVIATION PRODUCTS



### Folding Plane Seat

A new aircraft seat that folds into a neat, compact package, rapidly clearing passenger space into maximum flight space, is being produced by Bausi Aero Seat Co.

The new design, made in double and triple, full-reclining types, is interchangeable with conventional high density seats. It requires no expensive color side mounting structures or bag gage side armrests, company says.

The seat is stored at floor level and is compact enough to provide virtually enough clearance below the over head bins for passengers. Legs and feet first are folded and locked. Then the center seat is expanded and placed against the center wall. Proper positioning is provided by inserting two special fittings on the upholstered armrest into the face flanges that normally accommodate the outboard legs. Additional security is provided by a simple wall latch that attaches to the swiveling arm rest. Engagement when the arm is swiveled. This latch holds against the cabin wall when not in use.

The seat has a flexible rubber cushioning supported by flexible rubber straps, can accommodate a weight of 250 lb. with a 250 lb. over load, and weighs 40 lb. in the double and 69 lb. in the triplets model.

Bausi Aero Seat Co., Inc., 3990 Coliseum St., Burbank, Calif.



### Jet Ground Power

A new, mobile ground power unit, designed to supply electrical power needs of the aircraft, using B-47 bombers and other military craft, has been an

estimated to cost, Inc.

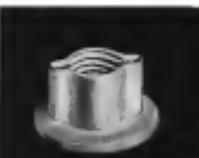
The unit is a compact, self-contained unit which provides electrical power for jet engine starting and checklist at engine gear. It supplies a continuous output of 1000 amp at 250 volt.

In tests with the B-47, it met an overload demand of 2000 amp at 250. Under these conditions, in which static motor current was 1000 at 2500 intervals, the voltage regulation was less than 8 volt, the company states.

Automatic controls are said to provide voltage regulation to better than ±1% at 2500 rpm, and to switch automatically to reverse in the negative direction, ±10%.

The unit, mounted on pneumatic casters and built for towing, has a multi-position selector switch to allow the operator to select the necessary voltage output characteristics for his particular testing in engine starting needs.

A model being produced for the aircraft carrier has separate power inputs, one for the plane's electrical equipment, the other for jet starting. Bausi, Inc., 8815 S. Main St., Los Angeles 3.



### Nut Pinches Bolt

A new, self-tightening instant bolt to give rugged resistance to vibration, impact, extremes of heat and cold and other conditions, has been developed by E. A. Batten Corp., Salem, Mass.

The bolt, dubbed "Gon-Tang," has a flange on one end, and a tapered set and witness bore to allow powerful longitudinal tension when applied to a bolt. The nut bolts securely to any position on the bolt, is tightened and can be reused无数次, says the firm. It employs no supplementary locking device.

E. A. Batten Corp., Salem, Mass.

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In addition to a complete range of standard models, Bowser can provide special equipment, with special accessories, if necessary, to meet individual requirements of temperature, humidity, vibration, shock, wind and dust, etc. Bowser's Engineering Staff leaves you the full advantage of their long continuous experience, the most versatile in the field.

<b>TYPE TEST BOLT</b>	
Bolt size: 1/4-20, 5/16-18, 3/8-16, 1/2-13, 9/16-12, 5/8-11, 3/4-9, 7/8-8, 1-6, 1-1/4-5, 1-1/2-4, 2-3, 2-1/2-2, 3-1/2-1, 4-1/2-1, 5-1/2-1, 6-1/2-1, 8-1/2-1, 10-1/2-1, 12-1/2-1, 14-1/2-1, 16-1/2-1, 18-1/2-1, 20-1/2-1, 22-1/2-1, 24-1/2-1, 26-1/2-1, 28-1/2-1, 30-1/2-1, 32-1/2-1, 34-1/2-1, 36-1/2-1, 38-1/2-1, 40-1/2-1, 42-1/2-1, 44-1/2-1, 46-1/2-1, 48-1/2-1, 50-1/2-1, 52-1/2-1, 54-1/2-1, 56-1/2-1, 58-1/2-1, 60-1/2-1, 62-1/2-1, 64-1/2-1, 66-1/2-1, 68-1/2-1, 70-1/2-1, 72-1/2-1, 74-1/2-1, 76-1/2-1, 78-1/2-1, 80-1/2-1, 82-1/2-1, 84-1/2-1, 86-1/2-1, 88-1/2-1, 90-1/2-1, 92-1/2-1, 94-1/2-1, 96-1/2-1, 98-1/2-1, 100-1/2-1, 102-1/2-1, 104-1/2-1, 106-1/2-1, 108-1/2-1, 110-1/2-1, 112-1/2-1, 114-1/2-1, 116-1/2-1, 118-1/2-1, 120-1/2-1, 122-1/2-1, 124-1/2-1, 126-1/2-1, 128-1/2-1, 130-1/2-1, 132-1/2-1, 134-1/2-1, 136-1/2-1, 138-1/2-1, 140-1/2-1, 142-1/2-1, 144-1/2-1, 146-1/2-1, 148-1/2-1, 150-1/2-1, 152-1/2-1, 154-1/2-1, 156-1/2-1, 158-1/2-1, 160-1/2-1, 162-1/2-1, 164-1/2-1, 166-1/2-1, 168-1/2-1, 170-1/2-1, 172-1/2-1, 174-1/2-1, 176-1/2-1, 178-1/2-1, 180-1/2-1, 182-1/2-1, 184-1/2-1, 186-1/2-1, 188-1/2-1, 190-1/2-1, 192-1/2-1, 194-1/2-1, 196-1/2-1, 198-1/2-1, 200-1/2-1, 202-1/2-1, 204-1/2-1, 206-1/2-1, 208-1/2-1, 210-1/2-1, 212-1/2-1, 214-1/2-1, 216-1/2-1, 218-1/2-1, 220-1/2-1, 222-1/2-1, 224-1/2-1, 226-1/2-1, 228-1/2-1, 230-1/2-1, 232-1/2-1, 234-1/2-1, 236-1/2-1, 238-1/2-1, 240-1/2-1, 242-1/2-1, 244-1/2-1, 246-1/2-1, 248-1/2-1, 250-1/2-1, 252-1/2-1, 254-1/2-1, 256-1/2-1, 258-1/2-1, 260-1/2-1, 262-1/2-1, 264-1/2-1, 266-1/2-1, 268-1/2-1, 270-1/2-1, 272-1/2-1, 274-1/2-1, 276-1/2-1, 278-1/2-1, 280-1/2-1, 282-1/2-1, 284-1/2-1, 286-1/2-1, 288-1/2-1, 290-1/2-1, 292-1/2-1, 294-1/2-1, 296-1/2-1, 298-1/2-1, 300-1/2-1, 302-1/2-1, 304-1/2-1, 306-1/2-1, 308-1/2-1, 310-1/2-1, 312-1/2-1, 314-1/2-1, 316-1/2-1, 318-1/2-1, 320-1/2-1, 322-1/2-1, 324-1/2-1, 326-1/2-1, 328-1/2-1, 330-1/2-1, 332-1/2-1, 334-1/2-1, 336-1/2-1, 338-1/2-1, 340-1/2-1, 342-1/2-1, 344-1/2-1, 346-1/2-1, 348-1/2-1, 350-1/2-1, 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Called "Rust Inhibitor No. 14-425," the product provides excellent holding of oil stains with one coat, reducing paintwork costs up to 50%, the firm said. It may be applied over dry metal surfaces and leaves a permanent finish. Available in several colors, including aluminum and zinc, it is an approved formula of the company's Geltite Rust Inhibitor No. 425.

United Laboratories, Inc., 1081 Euclid Ave., Cleveland 12, Ohio.

### Non-Toxic Dy/Chek

An improved Dy/Chek formula, reported to be one toxic, has been developed by Texas Products, Inc.

The product, a dye penetrant for detecting surface discontinuities and other imperfections in the wroughts of a previous Dy/Chek formula developed nine years ago for inspecting parts in the factory or the field. In addition to being nontoxic, the new formula also is said to be a more sensitive inspection medium than its predecessor.

Advantages claimed by Texas for the Dy/Chek process are its low cost, applicable to both ferrous and nonferrous metals, permeability and accuracy. The process requires no special equipment. It can be applied to parts by spraying, dipping or flooding.

Texas Products, Inc., Terminal Annex 1049, Los Angeles 54.

### Plastic Plane Parts

Development of single, new polyesters reported to find valuable use in lightweight, heat-resistant aircraft parts, has been announced by American Cyanamid Co.

Cyanamid's engineers say the new polyester has tensile strengths which, in comparison to those of 500°F for a full day under these conditions, the room reinforced by glass cloth, are a fibrous strength for a 30,000 to 35,000 psi. Best fiber modulus products can do a 13,000-20,000 psi on initial exposure to 500°F temperature, they claim.

This improved performance is made possible by using triallyl cyanamate, basic element in the plastics. A room-strength recently developed by the firm, triallyl cyanamate is now available to manufacturers for polyesters use.

The rugged material, all available in this type, PEC-7-69 general purpose resin, PEC-7-69 polyester-epoxy resin, polyester resin containing aluminum bromide and PEC-7-69 epoxy-toluene resin for impregnating cloth or cloth.

American Cyanamid Co., 10 Rockefeller Plaza, New York 18, N. Y.

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MARTIN 4-0-4 sports nosewheel skidbed on main wings and tail; its engines feature external nacels on lower right sides



MARTIN 4-0-4 has Heidly type vertical tail; its extends further along fuselage to wing trailing edge . . .

**How to Tell Them Apart:**

## This Is the Martin 4-0-4 . . .

On Jan. 15 Trans World Airlines and Eastern Air Lines put the new Martin 4-0-4 twin engine transport into scheduled passenger service. By mid-1953 the two carriers expect to have 100 of the planes in use.

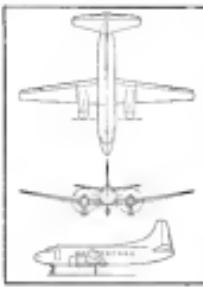
The Martin looks very much like its only competitor—the Convair 340. A low-compression-grade has been prepared by American Metal to help you recognize each of the models in commercial transports.

Although the Martin 4-0-4 and 2-0-2 look much like the Convair 240, MARTIN 4-0-4 wing has nearly equal taper in plan, passenger cabin has 18 windows

and its engine nacelles the 340, there are some basic differences.

• **Side View:** Chief impression is that the white Martin tail is stabler and lower than the rounded nose than the Convair. The center of the Martin's horizontal and the rounded Convair's is instead of lowered. Landing on ground they're easy to tell, as Martin steps down from bottom side, while Convair's come out of side ahead of wing.

Martin horizontal stabilizer is atop the tail cone and has sharp dihedral, while Convair's is in middle of tail cone and is flat. Convair engine nacelles have jet exhaust stacks on top of wing and project slightly behind wing trailing



CONVAIR 340's dihedral is less apparent, horizontal tail is conventional. Engines are more smoothly and closely cowlled



CONVAIR 340's vertical tail is more trimpled, vertical fin is slimmer, leading edge tapers more sharply than 4-0-4

## ... This Is the Convair 340

ing edges, while Martin's nosewheel leg goes down wing before reaching the flap.

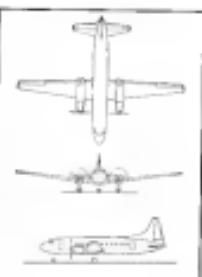
Martin has projectors at engine nacelle on the cockpit side under and atop the engine nacelles, while Convair has leading edge, fuselage and engine nacelle are smooth. Also, Martin has projecting fairings under wing, while Convair's fins are not noticeable from side.

• **Front View:** Sharp wing dihedral of Martin wing appears to start partway up engine, while Convair dihedral is oriented from wing root. Again, Martin's horizontal stabilizer has dihedral and is atop the tail cone, while Convair's is centered and is flat. Projecting fairings and flap hinges of Martin

are noticeable, while Convair looks clean. Martin engine nacelles are round, with projectors while Convair nacelles are drop but clean.

• **Plus View:** Convair's tail cone projects behind horizontal stabilizer. Convair wing is longer and thinner. Martin wing appears to sweep forward due to more tapered trailing edge, while Convair's appears to sweep off edge to tapered leading edge. Martin engine nacelle drops in wing, while Convair's project behind the wing.

CONVAIR 340 wing has dihedral sweep to leading edge, cabin has 18 windows.















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